CLAIMS

1. A rapidly solidified material consolidated into a bulk form for actuators and sensors, comprising a Fe-Ga magnetostrictive alloy which is obtained from slices, a powder or chops of a Fe-Ga alloy rapidly solidified material by spark plasma sintering, the Fe-Ga alloy rapidly solidified material having a high temperature-side disordered bcc structure and a fine columnar texture by a liquid rapid solidification method, being in a disordered to ordered transition composition range, and containing 15 to 23 atomic percent of Ga with respect to polycrystalline Fe.

2. The rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 1, wherein (001) crystalline anisotropy of a rapidly solidified thin belt of the Fe-Ga alloy is maintained.

3. The rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 1, wherein a magnetostriction of 170 to 230 ppm is obtained at room temperature by annealing following the sintering.

4. The rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 1, wherein a magnetostriction of 250 to 260 ppm is obtained at

room temperature by annealing in a magnetic field following the sintering.

5. A rapidly solidified material consolidated into a bulk form for actuators and sensors, comprising a TiNiCu shape-memory alloy which is obtained from slices, a powder or chops of a TiNiCu shape-memory alloy rapidly solidified material by spark plasma sintering, the TiNiCu shape-memory alloy rapidly solidified material being composed of an amorphous to nanocrystalline texture or an amorphous and nanocrystalline mixed texture by a liquid rapid solidification method.

6. The rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 5, wherein the TiNiCu shape-memory alloy is $Ti_{50+x}Ni_{40}Cu_{10-x}$ (where x is in the range of 0 to 4 on an atomic percent basis).

7. A method for producing the rapidly solidified material consolidated into a bulk form for actuators and sensors according to one of Claims 1 to 4, comprising the steps of: forming a rapidly solidified material by a liquid rapid solidification method from a Fe-Ga alloy having a high temperature-side disordered bcc structure and a fine

columnar texture, being in a disordered to an ordered transition composition range, and containing 15 to 23 atomic percent of Ga with respect to polycrystalline Fe; forming slices, a powder, or chops from the alloy as a raw material; and performing spark plasma sintering of the raw material at an application pressure of 50 MPa or more and at a sintering temperature of 873K or more under conditions in which the pressure and the temperature are controlled so that the texture of the rapidly solidified material is not lost.

8. A method for producing the rapidly solidified material consolidated into a bulk form for actuators and sensors according to Claim 5 or 6, comprising the steps of: forming a TiNiCu shape-memory alloy rapidly solidified material which is composed of an amorphous to a nanocrystalline texture or an amorphous and nanocrystalline mixed texture by a liquid rapid solidification method; forming slices, a powder, or chops from the alloy as a raw material; and performing spark plasma sintering of the raw material at a temperature less than a recrystallization temperature of a TiNiCu shape-memory alloy.

9. The method for producing a rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 8, wherein the TiNiCu shape-memory alloy

rapidly solidified material is wet-pulverized by rotary ball milling into slices, a powder, or chops.

10. The method for producing a rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 9, wherein the wet-pulverizing is performed using an alcohol.

11. The method for producing a rapidly solidified material consolidated into a bulk form for actuators and sensors, according to one of Claims 7 to 10, wherein annealing is performed after the sintering.

12. The method for producing a rapidly solidified material consolidated into a bulk form for actuators and sensors, according to Claim 11, wherein the crystal orientation of alloy properties is enhanced by annealing in a magnetic field after the sintering, and the magnetic moment (magnetic domain structure) directly relating to the magnetostriction is controlled.